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Forest Service

Sanpoil Watershed

Fisheries/ Hydrology Report

Prepared by:

Karen Vandersall
Fisheries Biologist/ Hydrologist

for:

Three Rivers Ranger District
Colville National Forest

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1.0 - Introduction

This joint aquatic assessment report includes both the assessment on hydrology and the fisheries biological evaluation. The proposed activities focused on in this report are those that have the potential to affect water or the aquatic environment in any way, including increases in temperature, fine sediment input, change in timing or duration of flow events, or increases in solar radiation and therefore temperature. Effects to fish populations will be evaluated based on any potential changes to water quality/quantity or available habitat. Project activities with the potential to affect these parameters are generally related to timber management operations including tree falling, skidding, temporary road construction/use and haul. In addition to timber operations, this report will analyze fuels treatments including prescribed burns, road improvements and decommissioning and thinning proposed within some riparian areas. Table 1 is the list of species considered to carry forward into the effects section of the report.

The 5th field and 6th field watersheds that overlap the project area are listed below. The Sanpoil project is partially within the O'Brien Creek, Scatter Creek, Ninemile Creek, Thirteenmile Creek, Upper Hall Creek and Seventeenmile sub watersheds but does not include all of the subwatersheds (see table 3). Subwatersheds are the basic unit for measuring changes to hydrology, aquatic biota and watershed resources.

Fifth Field Watersheds: Upper Sanpoil River, Middle Sanpoil River and Hall Creek

Sixth Field Sub-watersheds: O'Brien Creek, Ninemile Creek, Scatter Creek, Seventeenmile Creek, Thirteenmile Creek, and Upper Hall Creek

Table 1. Species presently listed for the CNF. This list is based off of IPaC website resource list pulled on 7/6/2018 for federally listed species and the current Regional Foresters sensitive species list. Project effects to those species with potential habitat in the area (shaded blocks) will be addressed in this report

Species	Status	Habitat present?	Documented in the area?	Habitat description / other comments
Bull trout (<i>Salvelinus confluentus</i>)	Threatened Surrogate Focal	Y	N	Cold lakes and streams. No critical habitat designated in project. They have not been found in the analysis area and are precluded from the area by natural barriers.
Westslope cutthroat trout (<i>Oncorhynchus clarki lewisi</i>)	Sensitive USFS Region 6 List Surrogate Focal	Y	N	Cold streams and lakes. They have not been found in the analysis area.
Interior Redband trout (<i>Oncorhynchus mykiss gairdneri</i>)/ Rainbow trout (<i>Oncorhynchus mykiss</i>)	Sensitive USFS Region 6 List Surrogate Focal	Y	Y	Cold streams and lakes. They are mainly on tributaries to Lake Roosevelt, the Kettle River, the Sanpoil River, and the Colville River. Redband are known to occur in South Fork O'Brien Creek.
Pygmy whitefish (<i>Prosopium coulteri</i>)	Sensitive USFS Region 6 List	N	N	Pygmy whitefish individuals and populations have been found in Sullivan Lake, Mill Pond and Bead Lake on the East zone of the Colville National Forest;

				over 45 air miles from the project area. This whitefish inhabits lakes and can utilize cold inlet streams tributary to lakes for spawning habitat. Pygmy whitefish and its habitat are not known within the analysis area.
Umatilla Dace (<i>Rhinichthys umatilla</i>)	Sensitive USFS Region 6 List	N	N	Umatilla dace and its habitat are not known within the analysis area. Umatilla dace need large rivers. The nearest known population of Umatilla dace in the Kettle River below Cascade Falls is in a different watershed than the project.
Lake Chub (<i>Couesius plumbeus</i>)	Sensitive USFS Region 6 List	Y	N	Lake Chub occur in varied habitats. Lake chub are most common in gravel-bottomed pools and stream reaches, and along rocky lake margins. Lake chub are known to occur Cedar Lake, approximately 30 miles to the ENE of the project area and are considered native to the Columbia River system. USFS surveys of the Kettle River indicate the species is likely present in this downstream main river. They have not been found in the analysis area and are precluded from the area by natural barriers.

2.0 - Relevant Laws, Regulations, and Policy

2.1 - Regulatory Framework

2.1.1 - Land Management Plan

The 2019 Colville National Forest Land Management Plan (LMP) provides standards and guidelines for Water Resources (55-57) and Riparian Management Areas (RMA) (121-129). This report incorporates the LMP by reference and is tiered to the Land Management Plan's Final Environmental Impact Statement (USDA Forest Service 2019).

Forest Plan Standards to achieve the Desired Future Conditions as related to this project:

FW-STD-WR-01. Best Management Practices

All projects shall be implemented in accordance with best management practices, as described in national and regional technical guides.

FW-STD-WR-02. Aquatic Invasive Species – In-Water Work

Implement prevention measures for in-water projects to decrease the potential for aquatic invasive species transference into non-infested water bodies.

MA-STD-RMA-03. Timber Harvest and Thinning

Timber harvest and other silvicultural practices can occur in RMAs only as necessary to attain desired conditions for aquatic and riparian resources. Vegetation in RMAs will not be subject to scheduled timber harvest.

MA-STD-RMA-05. Road and Trail Construction and Maintenance

There shall be no sidelaying or placement of fill in Riparian Management Areas, except where needed to construct or replace stream crossings. Snowplowing activities shall not allow runoff from roads and trails in locations where it could deliver sediment to streams.

MA-STD-RMA-06. Road and Trail Construction at Stream Crossings

At a minimum, all new or replaced permanent stream crossings shall accommodate at least the 100-year flood and its bedload and debris. The 100-year flood estimates will reflect the best available science regarding potential effects of climate change.

MA-STD-RMA-07. Road and Trail Construction-Fish Passage

Construction or reconstruction of stream crossings shall provide and maintain passage for all life stages of all native and desired non-native aquatic species and for riparian-dependent organisms where connectivity has been identified as an issue. Crossing designs shall reflect the best available science regarding potential effects of climate change on peak flows and low flows.

MA-STD-RMA-12. Wildland Fire and Fuels Management – Portable Pumps

Portable pump set-ups shall include containment provisions for fuel spills, and fuel containers shall have appropriate containment provisions. (Depending on underburning need for water)

MA-STD-RMA-13. Water Drafting

Fish habitat and water quality shall be protected when withdrawing water for administrative purposes. When drafting, pumps shall be screened at drafting sites to prevent entrainment of aquatic species, screen area shall be sized to prevent impingement on the screens, and shall have one-way valves to prevent back-flow into streams. Use appropriate screening criteria where listed fish or critical habitat are present. (if any drafting needs)

2.1.2 - Desired Condition

From the 2019 LMP:

FW-DC-WR-01. Natural Disturbance Regime of Aquatic and Riparian Systems

National Forest System lands contribute to the distribution, diversity, and resiliency of watershed and landscape-scale features, including natural disturbance regimes, of the aquatic, riparian, and wetland ecosystems to which plant and animal species, populations, and communities are adapted. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-02. Hydrologic and Aquatic and Riparian Habitat Connectivity

National Forest System lands contribute to uninterrupted physical and biological processes within and between watersheds. Floodplains, groundwater-dependent systems, upslope areas, headwater tributaries, and intact habitat refugia provide vertical, horizontal, and drainage network connections. These network

connections provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic, riparian-dependent, and many terrestrial species of plants and animals. Subbasin scale is used for Forest planning, and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-03. Self-Sustaining Native and Aquatic and Riparian-Dependent Species

National Forest System lands contribute to habitat and ecological conditions that are capable of supporting self-sustaining populations of native aquatic and riparian-dependent plant and animal species. Subbasin scale is used for forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-04. Physical Integrity of Aquatic and Riparian Habitat

National Forest System lands provide aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the Forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. Reference conditions can be drawn from the Forest or Provincial scales. Conditions assessed at the subbasin scale are used for forest and project planning.

FW-DC-WR-05. Water Quality

National Forest System lands contribute to water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality is within the range that maintains the biological, physical, and chemical integrity and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities, and meets appropriate Washington State water quality standards. Subbasin scale is used for forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-06. Sediment Regimes

National Forest System lands contribute to the sediment regime within the natural range of variation. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport. Watershed scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-07. In-stream Flows

National Forest System lands contribute to instream flows and groundwater sufficient to create and sustain riparian, aquatic, and wetland habitats, retain patterns of sediment, temperature, nutrient, and wood routing, and provide for (permitted or certificated) consumptive uses. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows functions in concert with local geology, valley types, soils and geomorphology. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-08. Floodplain Inundation

National Forest System lands contribute to the timing, variability, and duration of floodplain inundation that are within the natural range of variation. Fifth field watershed or subwatershed scale is used for both Forest and project planning.

FW-DC-WR-09. Groundwater-dependent Systems: Seeps, Springs, and Groundwater-fed Wetlands (Fens)

National Forest System lands contribute to the timing, variability, and water table elevation in groundwater-fed wetlands, seeps, springs, and other groundwater-dependent systems. These features are within or moving toward proper functioning condition. Subwatershed scale is used for both Forest and project planning.

FW-DC-WR-10. Water Production for Downstream Uses

National Forest System lands produce high-quality water for downstream ecological communities (including human communities) dependent upon them. Watershed scale is used for both Forest and project planning.

FW-DC-WR-11. Native Plant Communities

National Forest System lands contribute to the species composition and structural diversity of native plant communities in riparian management areas (including wetlands). These contribute to adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration; and supply amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-12. Aquatic Invasive and Non-Native Species

Aquatic invasive species do not occur as a component of lake, stream, and other riparian-related ecosystems or compete with native species for critical resources. Subbasin scale is used for Forest planning. Fifth field watershed or subwatershed scale is used for project planning.

FW-DC-WR-13. Aquatic Threatened, Endangered, and Sensitive Species

National Forest System lands contribute to the recovery of federally threatened and endangered aquatic species and conservation of Regional Forester's sensitive aquatic species. Aquatic habitat supports spawning, rearing, and/or other key life history requirements. Aquatic habitat also is designated as critical habitat for listed species (such as bull trout) in some areas. Subbasin scale is used for Forest planning and 5th field watershed or subwatershed scale is used for project planning.

FW-DC-WR-14. Resiliency to Climate Change

Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances. Subbasin scale is used for Forest planning and 5th field watershed scale is used for project planning.

FW-DC-WR-16. Key Watershed Network

Networks of watersheds with functional habitat and functionally intact ecosystems contribute to and enhance conservation and recovery of specific threatened, endangered, and/or sensitive aquatic species and high water quality and natural flow regimes. The networks contribute to short-term conservation and long-term recovery at the Recovery Unit or other appropriate population scale.

FW-DC-WR-17. Roads in Key Watersheds

Roads in key watersheds are not a risk to the function of soil and water resources. Roads do not disrupt hydrologic or aquatic habitat function or threatened and endangered species biological and behavioral attributes.

FW-DC-WR-18. Key Watershed Integrity

Key watersheds have high watershed integrity and contribute to resilient aquatic and riparian ecosystems.

FW-DC-WR-19. Focus and Priority Watershed Network

Focus and priority watersheds contribute to the sustainability of aquatic and riparian systems and species and provide resilient, productive habitat and high water quality.

MA-DC-RMA-01. Composition

Riparian Management Areas consist of native flora and fauna in a functional system and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.

MA-DC-RMA-02. Key Riparian Processes

Key riparian processes and conditions (including slope stability and associated vegetative root strength, capture and partitioning of water within the soil profile, wood delivery to streams and within the Riparian Management Areas, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistently with local disturbance regimes.

MA-DC-RMA-04. Roads

Roads located in or draining to Riparian Management Areas do not present a substantial risk to soil or hydrologic function. Roads do not disrupt riparian and aquatic function.

2.1.3 - Federal Law

Endangered Species Act and Critical Habitat units

There are no ESA fish species or ESA Critical Habitat Units within the planning area.

The Clean Water Act (1972) and Sections 319 and 303(d)

The Clean Water Act is a federal act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the Clean Water Act establishes requirements for states and tribes to identify and prioritize water bodies that do not meet water quality standards. A Colville National Forest TMDL Submittal Report for Temperature, Bacteria, pH, and Dissolved Oxygen (DO) was completed by Washington Department of Ecology (DOE) in June 2005. This TMDL only applies to streams or portions of streams on land managed by the Colville National Forest. On October 2006, Washington State DOE published the Colville National Forest Temperature and Bacteria TMDL, Water Quality Implementation Plan. This implementation plan supplements the Submittal Report and sets load allocations that identify how much a pollutant needs to be reduced or eliminated to achieve water quality standards. The Environmental Protection Agency (EPA) decided that the submittal report lacked some required components in the dissolved oxygen and pH analysis. Therefore, EPA did not approve the DO and pH portion of the TMDL. A TMDL is still needed for those streams listed for pH and DO within the Colville National Forest. This includes streams that are in the Sanpoil analysis area. Management direction (for DO and pH issues) will change upon completion of a TMDL. DO is affected by temperature, small organic debris and changes in the aeration rates of the stream. The Sanpoil Project was designed to minimize changes in temperature and treatments so are far enough from the water that accumulations of small organic material in the stream are not expected. Since organic inputs from the project are not expected to be above baseline levels, the pH of streams is not expected to be affected by project activities.

Table 2. Total Maximum Daily Load (TMDL) Assessment Units in the Sanpoil Watershed Project Area. The categorization of the WA State Waters did not begin until 2004.

12th Code HUC	Stream	Pollutant of Concern	*1996 Listing	*1998 Listing	#2004 Listing	#2008 Listing	#2012 Listing	#2016 Listing
O'Brien Creek 170200040106	South Fork O'Brien	Temperature	N	N	Waters of concern	Waters of concern**	Waters of concern**	Waters of concern**
		Bacteria & DO	N	N	Waters of concern	Waters of concern	Waters of concern	Waters of concern
		pH	Y	Y	Waters of concern	Waters of concern	Waters of concern	Waters of concern
Ninemile Creek 170200040107	Ninemile Creek	Temperature	N	N	Waters of concern	Waters of concern	Waters of concern	Waters of concern
		Fecal Coliform	N	N	Meets state standards	Meets state standards	Meets state standards	Meets state standards
Thirteenmile Creek 170200040107	Thirteenmile Creek	Fecal Coliform	N	N	Waters of concern	Waters of concern	Waters of concern	Waters of concern

*These years were before categories were established. Originally there was just a list and the streams were either on the list (Y) or not (N).

TMDL plan required notates the waters on the state 303D list. Waters of concern have some suspect water quality data but require more testing for impairment determination.

** Waters of Concern (Category 2) in state database but is included in the approved Colville NF TMDL plan for improvement for temperature so should actually be listed as under a TMDL plan (4a).

2.1.6 - Other Guidance or Recommendations

Upper Sanpoil River and West Fork Sanpoil River Watershed Action Plan (April 2012)

This document was developed to prioritize aquatic restoration projects on National Forest System Land within the Upper Sanpoil River and West Fork Sanpoil River 10th field watersheds for the improvement and recovery of water quality, fish habitat, and riparian forest conditions. It prioritizes subwatersheds and outlines restoration opportunities in these areas. Active restoration includes the usual suite of projects associated with watershed restoration – road upgrades, decommissioning, fixing erosion problems, improvement of riparian forests and instream habitat improvement. Passive restoration is vegetation recovery and growth accompanied with substantive and effective aquatic input by fish biologists and hydrologists during project planning to ensure the watershed remains on a recovery path.

3.0 – Analysis Framework

3.1 - Purpose and Need

Part of the purpose and need of this project is to improve or maintain water quality, watershed function and aquatic habitat in the Sanpoil project area. The Sanpoil area provides important habitat for fisheries and aquatic-dependent species. Water from the project area drains into the waterways on the Colville Indian Reservation and private land. FW-OBJ-WR-10 covers the Upper Sanpoil 5th scale watershed and Ninemile 6th field subwatershed with an objective of completing essential projects. This project proposes to address the remaining Aquatic Organism Passage (AOP) action items identified in the Upper Sanpoil

River and West Fork Sanpoil River Watershed Action Plan document within the project area and the Ninemile AOP essential project.

3.2 - Other Resource Concerns

The quantity of water coming from a subwatershed can be affected by changes in basal area, either by fire killing trees or by harvest of live trees. Review studies have indicated that 20-30% of the watershed must be clearcut to have a measurable effect on water yield (Bosh and Hewlett 1982, Stednick 1996), with changes decreasing with time after harvest. The only watershed where would be cut on more than 11% of the acres in the subwatershed is Ninemile which has thinning on 30% of the landscape. However, the heaviest treatment only cuts 80% of the basal area. Most of the units in this watershed have less than 60% basal area reduction so the basal area reduction. Treating 30% of the landscape at a partial cut of this nature would likely fall under the 20% minimum to affect hydrology (treating 30% of the landscape at a 60% basal area reduction equals an 18% effective basal area reduction). Though the O'Brien subwatershed has several other projects within it, those projects would only treat about 16% of the acres of the subwatershed and also would likely be a partial cut. Additionally they would be unlikely to all be cut in the same year as all the units in the O'Brien subwatershed and therefore would have less chance of amounting to measurable changes than treatments completed within the same year. Therefore water quantity will not be further addressed in this report.

Table 3. Percentages of Watersheds in Sanpoil Project and the Percentage of Subwatersheds Treated.

Subwatershed Name	Subwatershed Acres	Subwatershed acres in Sanpoil Project	% Subwatershed in project area	Subwatershed Approximate vegetation treatment Acres All treatments/ minus Underburning only	% Subwatershed with vegetative treatment
O'Brien Creek	28,809	10,136	35.2	3,680/3,084	12.8/10.7
Scatter Creek	31,313	5,814	18.6	3,690/1,675	11.8/5.3
Ninemile Creek	16,726	16,721	100	6,067/5,223	36.3/30.0
Thirteenmile Creek	18,780	11,236	59.8	4,161/566	22.2/3.0
Upper Hall Creek	31,648	3,261	10.3	524	2.8
Seventeenmile Creek	18,504	788	4.3	0	0

Fecal coliform levels would not be directly affected by the project since measurements are based on feces entering the water. To mitigate the chance that the project will increase ungulate access to the streams,

and therefore mitigate the chance of increased fecal coliform, there is a west zone standard practice (see project standard practices). Therefore, fecal coliform will not be further addressed in this report.

3.3 - Resource Indicators and Measures

The primary resource indicators we will be evaluating are those pertaining to water quality. To analyze this project and all associated activities, we will be looking at the proximity of project activities to live/surface connected waters and the potential or likelihood of those project activities resulting in the increased delivery of sediment to the water body or influencing the shade or future large wood recruitment. Proposed activities will be measured against the current condition where available.

Table 4. Resource Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LMP S/G; law or policy, BMPs, etc.)?
Water quality	Sediment delivery	Road surface and condition in proximity to water (as measured by WCF indicators; road maintenance, proximity to water, and channel shape and function.)	Yes, Purpose and need	FW-OBJ-WR-04, FW-OBJ-WR-06, FW-STD-WR-01, MA-OBJ-RMA-02, MA-STD-RMA-05
Water quality	Stream temperature	WCF indicators: riparian/ wetland vegetation (vegetation condition) and	No	WCF-DC-WR-05, FW-DC-WR-14
Riparian Function, and Channel Stability	Large woody debris recruitment	WCF indicators: large woody debris(LWD)	No	FW-DC-WR-04, FW-DC-WR-11, MA-DC-RMA-02, MA-STD-RMA-03
Hydrologic Function	Effective stream length and debris passage	WCF indicators: road density and habitat fragmentation	No	FW-DC-WR-02, MA-STD-RMA-06, MA-STD-RMA-07

4.0 - Methodology

The effects analysis will be based on the proximity of disturbances to area water bodies and the potential/probable mechanisms to deliver mobilized sediments to those water bodies. Assumptions used for this analysis will be based on local geography, soils, riparian vegetation conditions, weather, and observations/effectiveness of National Best Management Practices (BMPs) in similar circumstances on the district. Because there are no proposed activities within live water or occupied fish habitats, effects to hydrology and fish will be determined based on measurable changes to habitats and/or water quantity/quality as a result of proposed project activities. Proposed activities will be evaluated as to whether they result in a change to any of the four resource indicators identified and if so, how do those changes affect food webs, habitat, water chemistry, and fish populations.

Five streams in the Sanpoil project area, including four fish-bearing and one non fish-bearing (Tenmile), had surveys completed since 2009 by the Colville National Forest Fish Crew using the R6 stream survey protocol, with all but Ten Mile Creek completed in the last seven years. Non fish-bearing streams were surveyed in 2010 by the Colville National Forest hydrology crew.

4.1 - Information Sources

- USFS Level II Hankin and Reeves Stream Surveys
- US Forest Service water temperature monitoring data
- Colville Rosgen Geomorphology Protocol surveys
- Sanpoil GRAIP lite analysis
- Road surveys on roads the GRAIP lite analysis indicated were higher risk
- GIS layers

4.2 - Incomplete and Unavailable Information

Applicable standards and guidelines, national BMPs and Project Design Features (PDFs) are effective at isolating and protecting the aquatic environment including habitats, flow regimes and water chemistry from the proposed project activities. Any unknown situation should be handled by applying these practices. For instance, if there is a wetland found within unit boundaries during layout, a Riparian Management Area will be placed around it and appropriate management activities will be prescribed based on these practices.

4.3 - Spatial and Temporal Context for Effects Analysis

4.3.1 - Direct/Indirect Effects Boundaries

The spatial boundaries for analyzing the direct and indirect effects to hydrology and fisheries are the Upper Hall Creek, Thirteenmile Creek, Ninemile Creek, Scatter Creek and O'Brien Creek subwatersheds, because this is the extent that is affected by treatments. Sixth field watersheds are small enough that effects can be detected and large enough to measure the overall effects within a project.

The temporal boundaries for analyzing the direct and indirect effects are the timeframe of the treatment plus one wet season (approximately 2023-2027), because it is the period which indirect effects could reasonably occur. Shading and sediment movement could be affected by the first winter/spring runoff after treatment.

4.3.2 - Cumulative Effects Boundaries

Spatial and temporal boundaries set the limits for selecting the actions most likely to contribute to cumulative effects (FSH 1909.15, 15.2).

The spatial boundaries for analyzing the direct and indirect effects to hydrology and fisheries are the Upper Hall Creek, Thirteenmile Creek, Ninemile Creek, Scatter Creek and O'Brien Creek subwatersheds because sixth field subwatersheds are small enough that effects can be seen.

The temporal boundaries for analyzing the cumulative effects are twenty to thirty years each side of the treatment, because canopy closure can slowly increase affecting temperatures and sedimentation from roads is dependent on surface and level of vegetation on the road or decommissioned roadbed.

5.0 - Affected Environment

5.1 - Existing Condition

Fisheries in the analysis area include trout fisheries on South Fork O'Brien Creek, Ninemile Creek, South Fork Ninemile and Thirteenmile Creek. South Fork O'Brien Creek has Eastern brook trout and redband trout. The other named streams contain Eastern Brook trout. Habitat for native trout will be protected through implementation of the LMP (2019).

South Fork O'Brien Creek

The lowest two reaches of South Fork O'Brien were profoundly affected by floods in 1998. This area has a broader valley and less steep gradient than is typical of higher mountain streams. Because of this, these reaches absorbed sediment coming downstream and the channels changed courses during the flood. Surveys conducted in 2013 and 2014 found that the riparian hardwood component has returned and that these reaches contain both redband trout and brook trout. It provides habitat for redband trout and Eastern brook trout, though temperatures exceed the state temperature standard of 16 degrees Celsius near the forest boundary.

The upper reaches (reaches 4-6) are more typical mountain reaches with steep slopes and a riparian community is reestablishing after the 1998 floods. These reaches have steep valley walls, and adequate amounts of LWD. It provides good habitat for Eastern brook trout.

Ninemile and South Fork Ninemile

Ninemile and South Fork Ninemile are in the Ninemile subwatershed. Both creeks support primarily eastern brook trout throughout their length. Ninemile creek has a few rainbows at the mouth. The portion of Ninemile Creek above the falls and the South Fork was probably non-fish bearing historically due to the natural blockage of a falls that predates glacial activity. This portion presently contains only brook trout. The above-falls portion of these creeks was planted with brook trout early this century. Surveys completed in 2013 and 2014 indicated that large woody debris are unevenly distributed on Ninemile with some sections with high LWD and some that are low in LWD. South Fork Ninemile has sufficient LWD. Pools per mile in Ninemile are generally sufficient in most reaches though South Fork Ninemile is still deficient in pools. Most of the width to depth ratios in both streams was deficient.

Thirteenmile

Thirteenmile Creek supports both rainbow and eastern brook trout in the lowest reach with strictly eastern brook trout in the next reach due to the natural blockage of a falls between the two reaches. The falls predate the glacial activity so it is likely the portion upstream from the falls was also non-fishbearing. The above-falls portion of Thirteenmile creek was planted to brook trout in the 1960s.

Non-fish bearing streams

Though the portion of Tenmile creek in the project area was surveyed using the R6 protocol in 2009, this portion goes dry in most years and therefore is non-fish bearing. Other non-fish bearing streams were surveyed in 2010. A map, methodology description, and more results from the surveys are in the Three Rivers Ranger District hydrology files. Range impacts from cattle trailing up stream channels between roads or concentrated use in localized areas has caused channel instability in some channels.

Table 5. Resource Indicators and Measures for the Existing Condition

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition	
Water quality	Sediment delivery	Road surface and condition in proximity to water (as measured by pools per mile (PPM) and width to depth ratio (WDR) for fish)	Most Ninemile reaches and all S.F Ninemile reaches are not properly functioning for channel shape and function. Thirteenmile and S. F. O'Brien are functioning at risk for this indicator.	
Water quality	Stream temperature	Canopy cover changes	Ninemile is out of compliance in some years (functioning at risk). O'Brien Creek is impaired. Other creeks measured are within standards (properly functioning)	
Riparian Function and Channel Stability	Large woody debris recruitment	LWD and Dominant and subdominant trees	Approximately half of Ninemile reaches and all of Thirteenmile are low in large wood (making these areas impaired function for large wood). Other fish bearing streams are currently considered Functioning a Risk (Scatter) or Properly Functioning (O'Brien and Upper Hall)	
Hydrologic Function	Effective stream length and passage of both organisms and stream material	Road density	Subwatershed	All
			O'Brien Ninemile Scatter Creek Thirteenmile Upper Hall	Functioning at Risk 2.0 mi/mi ² Impaired Function -2.9 mi/mi ² Impaired Function -4.1 mi/mi ² Properly Functioning - 0.96 mi/mi ² Properly Functioning - 0.52 mi/mi ²

5.1.1 - Resource Indicator and Measure 1, Sediment Delivery

The proxy for determining the existing sediment delivery effects to stream is the channel shape and function component of the Watershed Condition Framework. When the sediment budget of a stream is higher than natural levels, width to depth ratios can rise and pools per mile can decrease.

Table 6. Watershed Condition Framework Scores for Channel Shape and Function

WCF Indicator	O'Brien subwatershed	Ninemile subwatershed	Scatter subwatershed	Thirteenmile subwatershed	Upper Hall subwatershed
Channel Shape and function	Functioning at risk – surveys indicated average width to depth ratios slightly high in two reaches.	Impaired Function – almost all reaches have channel issues.	Functioning at risk – based on historic surveys. Main fish bearing stream outside current project area.	Functioning at risk – surveys indicated average width to depth ratios slightly high in two of the reaches. Historic surveys further upstream indicate good channel stability.	Impaired Function – based on historic surveys. Main fish bearing stream outside current project area.

A Geomorphic Road Assessment and Inventory Package lite (GRAIP lite) was completed for the Sanpoil Project. This assessment modeled roads and a subset of roads including all modeled as being in the top 20% of sediment producers was then surveyed by crews to determine if problems existed. Surveys found problems with approximately 15 roads that were brought forward to the transportation analysis for potential project actions. McMann Creek road has two particularly problematic sections. The first is the

west end where the road enters the forest and climbs up a steep slope. Currently the drainage of the road is inadequate and water either runs down long portions of the road or drops to the next switchback and continues down that switchback. This water eventually enters McMann creek along a portion of the road in the streams RMA. Further up McMann Creek there is a section of the road that runs along the creek for over ¾ mile with sedimentation reaching the creek.

The 2050-340 road is a level 1 road in inventoried roadless area with several stream crossings that still have culverts in them. This includes one area where the crossing is in a wetland area with three small culverts and has very likely changed the extent and shape of the wetland.

Many other level 1 roads still have culverts that are undersized. 2050-390 is needed for yearly RAWS access but has two areas where streams cross the road without a planned crossing that are incurring damage. 2050-290 follows a stream for most of its length. The road has gone below grade and is within 10 feet of the channel in several areas. If the road goes further below grade it will likely capture the stream for the length downstream of that point. That stream currently is diverted approximately 150m at the crossing of 2050-473.

5.1.2 - Resource Indicator and Measure 2, Temperature

When stream surveys were done temperatures were taken several times a day as the crew worked up the streams. A summary of maximum temperature per reach is displayed below:

Table 7. Maximum stream temperature on each reach for stream surveys

Stream	Reach	Channel Length (Feet)	Survey Maximum Temp. (°C)	Meets State Standards for Temperature
Ninemile Crk	1	2,446	10.6	Yes
Ninemile Crk	2	2,376	11.7	Yes
Ninemile Crk	3	6,913	12.2	Yes
Ninemile Crk	4	9,836	13.3	Yes
Ninemile Crk	5	6,254	13.3	Yes
Ninemile Crk	6	5,954	12.2	Yes
Ninemile Crk	7	5,539	11.7	Yes
Ninemile Crk	8	3,010	2.7	Yes
Ninemile Crk	9	6,541	11	Yes
Ninemile Crk	10	4,159	13	Yes
Ninemile Crk	11	4,427	8.4	Yes
S. F. O'Brien Crk	1	11,667	14.4	Yes
S. F. O'Brien Crk	2	5,461	11	Yes
S. F. O'Brien Crk	4	6,132	14	Yes
S. F. O'Brien Crk	5	3,075	12	Yes
S. F. O'Brien Crk	6	3,370	12	Yes
Thirteenmile Crk	2	4,552	14	Yes
Thirteenmile Crk	3	4,911	14	Yes
Thirteenmile Crk	4	8,730	14	Yes
S. F. Ninemile Crk	1	5,120	5	Yes

S. F. Ninemile Crk	2	6,266	7.9	Yes
Tenmile Creek	1	46	9.1	Yes

All temperatures were below the 16 degrees Celsius that follows Washington State trout water quality standards. In addition there have been fixed temperature continuous monitoring stations on five waterways in the project area for from two to twelve years. They are generally on the lowest reach of each stream before leaving Forest Service Lands and therefore are usually the warmest. Sanpoil and Thirteenmile streams were within standards for all six and two years monitored respectively. Tenmile creek is usually more of a seasonal stream and exceeded standards on one of two years. Ninemile stream has exceeded the standard in two of six years it was monitored. South Fork O'Brien has exceeded the standard in all but two of the twelve years it has been monitored and is under the Colville water quality improvement plan. Other streams in the project area have no specific temperature monitoring, however smaller streams tend to be colder streams.

5.1.3 - Resource Indicator and Measure 3, Large Woody Debris

Large Woody Debris is an important habitat and structural component for streams. Though woody material jams often form with many smaller pieces there are usually one or more larger pieces of wood that are the core of the structure. In order to maintain a healthy stream delivery of large woody material, large woody debris must be maintained over time. Project activities that can affect large woody debris include any activities that remove large trees or prevent tree recruitment where trees are not already present. This can include harvest activities or fuel reduction projects that prevent trees from reaching large wood sizes. It can also occur indirectly from opening up cattle access to the RMA which may lead to overgrazing and failure of tree recruitment that would otherwise occur. Roads also decrease large woody debris by cutting off the RMA and allowing access to wood cutters.

South Fork O'Brien and South Fork Ninemile are properly functioning as shown in the table below. Some of the Ninemile reaches are low in large wood, including the beaver marsh reach and two reaches above it. This indicates that the higher section may not be recruiting sufficient wood currently. The two lowest deficient reaches in Ninemile are in a gorge section and may naturally transport wood during storms rather than keeping it within bankfull jams. The three reaches of Thirteenmile surveyed for this project were low in large wood. For the bottom two reaches the stream is in a gorge and so reasons for low wood totals may be similar to the gorge sections of Ninemile.

Table 8. Watershed Condition Framework Scores for Large Wood

WCF Indicator	O'Brien subwatershed	Ninemile subwatershed	Scatter subwatershed	Thirteenmile subwatershed	Upper Hall subwatershed
Large Wood	Properly Functioning – Surveys indicated all reaches contained sufficient amounts of wood	Impaired Function – Five of thirteen fish bearing reaches are low on large wood	Functioning at risk – from historical surveys. Main fish bearing stream outside current project area.	Impaired Function – All recently surveyed reaches are low on large wood.	Properly Functioning – from historical surveys. Main fish bearing stream outside current project area.

5.1.4 - Resource Indicator and Measure 4, Stream Length and Passage of Organisms and Material (Road Density)

Because roads can reroute water in a watershed and prevent natural movement of aquatic species, sediment and large woody material through road crossings they have a high potential to impact watersheds. Watershed condition framework was adopted by the Forest Service to determine the health of subwatersheds in 2006. There are twelve indicators that each contribute between 2% and 15% to the overall score. Road and trail attributes contributes 15% of the score, over half of which is related to road density. The Seventeenmile watershed was dropped from this indicator since there are no FS roads in the watershed within the project area so there can be no potential effects to roads from the project. Road density from the forest road layer varies from 0.52 mi/mi² in Upper Hall creek subwatershed to 4.1 mi/m² in the Scatter Creek subwatershed. The density is good in the Upper Hall Creek and Thirteenmile subwatersheds, fair in the O'Brien subwatershed and poor in the Ninemile and Scatter Creek subwatersheds. The culvert on 2054 across Ninemile Creek and the culvert on 2054-200 across South Fork Ninemile are identified as fish barriers.

6.0 - Environmental Consequences

6.1 - Alternative 1 – No Action Under the no action alternative most of the resource indicators would remain near present levels unless a large wildland fire occurs. Roads likely would be maintained in the same condition as they are now and well-used roads may continue to increase sediment delivery to the streams between maintenance intervals. Canopy closure would likely continue to increase in the riparian zone with an increase in shading and potential decrease in stream temperature. With the forest density class increasing over time (Pfeiffer, 2020) large wood would continue to recruit into streams. However, the fire condition class is already class 2 in 97% of the area, indicating that fire frequencies are moderately altered from their historical range (Corvino, 2020). With no treatment, stands would continue to move towards fire condition class 3 where dramatic changes to fire behavior are likely. This increases the chance that a higher severity fire would affect the streams. If a larger or higher severity fire burns in this area, then it is likely that sedimentation in the area affected by the fire would increase and canopy cover near the affected streams would decrease. Large wood recruitment in the moderately severe burn area would increase in the short term (up to 20 years), followed by low recruitment rate until the surrounding forests recover in over the following several decades. Large wetlands or meadow areas such as the beaver pond area on Ninemile and the meadow reach on lower O'Brien creek would have capacity to absorb sediment so sediment from fires above these reaches would likely not reach the Sanpoil. However, there is a redband population in the lower reaches of O'Brien so sedimentation could affect spawning habitat negatively and therefore impact this population.

Table 9. Resource Indicators and Measures for Alternative 1

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	(Alternative 1)
Water quality	Sediment delivery	Road surface and condition in proximity to water (affecting PPM and WDR for fish)	Remains the same if no large fire, increases if a fire occurs
Water quality	Stream temperature	Canopy cover changes	Slowly increases over time if no large moderate or moderately severe wildland fire, decreases with such fires
Riparian Function and Channel Stability	Large woody debris recruitment	LWM and dominant and subdominant trees	Remains near present levels if no moderately severe wildland fires near streams, conversion to LWM then lack of recruitment if such fire occurs

Hydrologic Function	Effective stream length and passage of both organisms and stream material	Road density	Remains the same
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6.2 - Alternative 2 – Proposed Action

6.2.1 - Project Design Features

The following standard practices and design features have been incorporated into the project to protect hydrology and fisheries:

Design Element	Locations (units)
The following units border sections of water that have exceeded state temperature standards more than one year. Treatment within 150ft of streams in these RMA's would be aimed at increasing stream shading over the next twenty years. Work towards historic reference conditions which may include re-establishing riparian hardwoods.	O'Brien: 7, 21, 37, 201, 531, 532 Ninemile: 85, 101, 125, 162, 163, 193
For the 2050-473 south of the 2050-470 junction and the 2050-290 road before it turns N away from the stream in section 6, the logging operations would only reuse these roads over 1 dry season or over snow and hydrologically stabilize the roads before the next spring flows to prevent capturing or worsening capture of the stream.	Units 82 and 86
Units entering the RMA of reaches of stream that are low on large wood without equipment access to the streams would retain all trees over 21" DBH within the RMA to retain potential to recruit large wood into the stream. The intent is to retain trees that are at least 12" diameter 35' from the large end.	Units 84, 124, 125, 197
Units entering RMAs to within 50 feet of the stream reach which is low on large wood which have trees qualifying as large wood would include wood enhancement of the stream in the prescription and project design. The design would include delivering at least 40 trees per mile of stream in or adjacent to the unit. Trees would be at least 12" diameter 35' from the large end to the bankfull dimensions of the stream (generally 21" dbh or larger). The intent is to help correct a large wood shortage in upper Ninemile Creek.	Units 1 and 118

Standard Practices

- Category 1: Fish-bearing streams:** RMAs consist of the stream and the area on each side of the stream, extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees,¹ or 300 ft. slope distance (600 ft. total,

¹ A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.

including both sides of the stream channel), whichever is greatest. It is expected that RMA widths along fish-bearing streams will not be less than described here.

Category 2: Permanently flowing, non-fish-bearing streams: RMAs consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Category 3: Constructed Ponds and reservoirs, and wetlands greater than one acre: RMAs consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than one acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Category 4: Lakes and natural ponds: RMAs consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Category 5: Seasonally flowing or intermittent streams, wetlands, seeps and springs less than one acre, and unstable and potentially unstable areas: This category applies to features with high variability in size and site-specific characteristics. At a minimum, these RMAs should include:

The extent of unstable and potentially unstable areas (including earthflows).

The stream channel and extent to the top of the inner gorge.

The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation or wetland, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.

2. Three Zones of the Riparian Management Areas (RMAs) – These design elements apply to all treatment units and wetlands, springs, seeps, and streams found during the project. The intent is to move vegetation toward the goals set forth in LMP in the RMAs while protecting fish habitat and water quality. Treatment in RMA units should be reviewed by the Hydrologist or Fisheries Biologist during presale activities; this review may occur as an office review.

Zone 1 – Immediately around a stream, wetland, or other water body

Treatment – 15 foot no treatment buffer. Activities can occur only to enhance fisheries or make watershed improvements.

Intent - protect stream banks and do not allow stream bank trees to be removed.

Zone 2 –the extent of the riparian vegetation or wet soils, whichever is greater

Treatment – no mechanical treatment or pile burning. Hand treatment of fuels may be allowed, prescribed fire would be allowed to creep into this zone, but no active ignitions would occur. Avoid firelines and hose lays that run parallel to stream channels, avoid using foam near stream channels.

Intent - limit soil impacts on sensitive wet soils and limit bare areas created by pile burning. Avoid sediment delivery and foam contamination of streams by letting the fire die out in the RMA.

Zone 3a –the remainder of the RMA containing upland vegetation where a road occurs

Treatment Upslope of Roads- allow unit treatment as prescribed

Treatment Downslope of Road – keep machinery back 50 feet from the slope break or inner gorge. Protect all tree and large shrub hardwoods. Retain a portion of conifer species in western hemlock, Engelmann spruce, and western red cedar as appropriate to the disturbance regime. Limit the removal of dominant and co-dominant conifers in the overstory canopy on the south side of streams.

Slope is less than 20%, and the area is beyond 50 feet of the inner gorge, allow canopy removal would be less than 25%. Harvest is allowed with consultation with the Fisheries Biologist, Hydrologist, or Soils Scientist. To prevent creating a fuel problem, log with tops attached if possible.

If the slope is greater than 20%, no commercial harvest would occur. Apply treatments as per Zone 2 above.

If a barrier to the riparian area is breached, windrows would be created between the riparian area and the treatment, or a fence would be installed to keep cattle out of riparian areas.

Intent - is to not destabilize the slope break or work on steep side slopes that directly input into streams and to protect the stream channel, enhance the large woody debris within the stream channels and RMA, and prevent increases in water temperature by retaining shade. Intent is also that treatments along streams and wetlands not increase cattle access to riparian areas.

Zone 3b –the remainder of the RMA containing upland vegetation where no roads occur within Zone 3.

Treatment - In units adjacent to streams, machinery would need to stay back 50 feet from the slope break or inner gorge. Mechanical piling and leave tops attached would be allowed with consultation with the Fisheries Biologist, Hydrologist, or Soil Scientist. Single passes of harvest machinery are allowed under the following conditions:

Harvest under winter or summer dry condition or over a slash mat (to reduce bare soil);

Slope towards stream is less than 20%;

Soil is not erosion sensitive (as identified by the Soil Scientist);

Intent - to not destabilize the slope break or work on steep side slopes that directly input into streams.

3. Temporary crossings require dewatering, isolation from flow, or dry conditions to install. Those on fish bearing streams and those that would be in place outside of fish work windows (varies per stream, most restrictive is July 1 to August 31) of one year would require aquatics staff to facilitate Washington Department of Fish and Wildlife (WDFW) Memorandum Of Understanding (MOU) compliance. The streambed and streambank would be restored to pre-project conditions following removal of the crossing.

4. Locate all refueling and servicing sites outside the Riparian Management Area. The intent is to prevent fuel spills and to minimize activities within the Riparian Management Areas.

5. No direct lighting of prescribed fire in RMA's. Fire may be allowed to back into the RMA's where fire control measures would cause more impact than the burn. Burn plans would minimize canopy cover loss in RMAs and loss of downed large wood near channels.

6. Piles in the RMA would be outside of zones 1 and 2. Piles would be burned during late fall through early spring while fuel moisture levels are high enough to limit fire spread. Raking around large trees and shade tolerant species to prevent mortality is recommended. A minimum of 90% organic material (duff) would remain on the ground in the RMAs after pile burning in order to protect soil and minimize sediment delivery to streams. The intent is to minimize the effects of prescribed fire on soil, water quality, and riparian resources. This applies to all burning within the Riparian Management Areas.

7. In order to avoid fish entrainments into pumps and to prevent barriers to fish movement, non-emergency fire response and non-emergency pumping of water and construction of associated small sandbag or gravel berm dams with hand tools would include the following:

- a) The location, pumping rate, and duration of non-emergency water withdrawals will be designed to minimize aquatic impacts. Non-emergency pumping shall not reduce streamflow to the detriment of fish life. Consult the Fisheries Biologist if adequate streamflow levels are in question.
- b) Any pump used for withdrawing water from fish-bearing waterbodies shall be equipped with a fish guard to prevent passage of fish into the pump. The pump intake will be screened with 3/32 inch or smaller mesh and the screen must have at least one square foot of functional screen area for every cubic foot per second (cfs) of water drawn through it. Screen maintenance shall be adequate to prevent injury or entrapment to juvenile fish and shall remain in place whenever water is withdrawn from waterbodies through the pump intake.
- c) Temporary gravel berm dams will be constructed of gravels available on-site within the bankfull channel, or of clean, round gravel transported to the site.
- d) No dirt from outside the bankfull channel will be used to seal the dam and no logs or woody material within the bankfull channel shall be utilized for construction of the temporary dam.
- e) Temporary sandbag or gravel berm dams will be completely dismantled and the streambed restored to its original condition following completion of withdrawal.

8. The Silviculturist, Fisheries Biologist, and/or Hydrologist will be involved in developing treatment prescriptions in the RMAs. The intent is to offer enhanced protection to the more sensitive aquatic areas.

9. Parking, staging areas, and landings will be located outside the RMA unless there is no other suitable location. In that case, a Hydrologist or Fisheries Biologist will be consulted on all proposed landing locations within RMAs. The intent is to minimize the effects of management activities on soils, water quality, and riparian resources.

10. When removing hazardous trees within the RMA, retain the tree on site and drop it towards the stream. The intent is to protect the stream channel and enhance the large woody debris within the stream channels and RMA. This applies to all hazardous tree removal within the RMAs.

11. During project activities, do not create openings by removing or killing trees, openings larger than ½ acre or an opening large enough for camping or parking in RMAs. This includes keeping fire severity low when underburning to reduce the potential of killing large patches of trees because firewood gatherers often remove the dead trees and leave openings. The intent is to reduce recreational cumulative impacts to RMAs.

12. Wood will not be removed from the stream channels. At least 35 feet of all existing downed trees of 12 inches or greater in diameter, within or overhanging the stream channel would be left in place to meet

large woody debris objectives. The intent is to enhance the large woody debris within the stream channels and RMAs. This applies to all RMAs.

6.2.3 - Direct and Indirect Effects - Alternative 2

There are redband trout in the lower section of O'Brien Creek. However, since no in stream actions are proposed in this section of O'Brien Creek all effects to species would be from the direct and indirect effects to habitat and therefore would be indirect effects.

Resource Indicator and Measure 1

Direct effects to sedimentation include the potential construction of temporary crossings to implement timber harvest. Though these crossings would be constructed to minimally affect flow, the installation is likely to cause some sediment to enter the streambed which would increase sedimentation in the immediate vicinity of the crossing. Indirect effects to sedimentation include the maintenance and reconstruction of roads used by the project. The project contains over 56 miles of stored roads. Those to be used during the project would need to be opened and would require maintenance that could increase sedimentation. However, the implementation of best management practices during road maintenance may lead to less of the sediment produced by roads entering the stream system. This alternative proposes to decommission 1.75 miles of roads and would hydrologically stabilize several more level 1 roads, including the 2050-300 road. Treatments are far enough from the streams and have standard practices applied such that no sediment is expected to reach streams through harvest or underburning practices. This alternative could contribute more sediment to the streams in the short term – defined as the first 5-10 years once treatment begins. However, it is expected that road repair and maintenance would reduce sediment thereafter for at least another decade. This alternative results in some decreasing trends in fire condition class in the project area (Corvino, 2020) and therefore may result in a lower risk of a wildfire increasing sedimentation.

Resource Indicator and Measure 2

This alternative allows harvest and underburning within RMAs and therefore could cause changes in the canopy cover within 110ft. Since the treatments in the RMAs are designed to primarily remove smaller trees and leave the largest trees the changes in canopy cover are expected to be small and transient in nature. These changes could last up to five years and are offset by increased resilience to fire post-treatment. In some cases removing trees may release the remaining trees to grow faster, providing more shade over time whether or not a fire comes through the RMA.

Resource Indicator and Measure 3

Alternative 2 would improve large wood in the upper reaches of Ninemile creek. The design element to implement large wood enhancement in two units would bring the large wood in the top inventoried reach of Ninemile would return to the estimated natural range of variability. Over time wood may move downstream helping large wood conditions in the next two downstream sections. In other large wood deficient portions of Ninemile if treatment enters the RMA there is a design element to retain wood likely to qualify as wood in the short term and treatments may release trees so that they attain large wood size more quickly than without treatment. There may be some incidental woody debris reductions at stream crossing improvement sites. An example would be if some roadside vegetation was removed during replacement of an existing culvert. Otherwise the treatments within RMAs are designed to maintain larger trees and there is minimal risk of reduced large woody debris from implementation of treatments. The improvement in fire condition class would decrease the chance of a fire skewing large woody debris recruitment.

Resource Indicator and Measure 4

Alternative 2 would administratively close approximately 1 mile of road and decommission approximately 1.75 miles of level 1 (closed) roads. Approximately .6 miles of closed road would be converted to non-motorized trail. This is spread across four subwatersheds. The subwatershed with the most road changes is the O'Brien subwatershed with the 1 mile of administrative road closure, 1.1 miles of road decommissioning, and the trail conversion proposed within this subwatershed. This would drop the road density in the O'Brien subwatershed from 2.0 mi/mi² to 1.9 mi/mi². In the Thirteenmile subwatershed approximately .25 miles of level one road would be decommissioned dropping the total road density from .96 to .95 mi/mi². Though both the Ninemile and Scatter subwatersheds both have road decommissioning, the mileage is not enough to affect road density at the tenth of a mile level. During the project the proposed construction of 3.65 miles of temporary roads and use of 7.97 miles of templates not on the forest service system could increase the density in the three subwatersheds that they occur within. If decommissioning is not done post project, the road densities could reach 3.1 mi/mi² in the Ninemile subwatershed. The temporary roads built in the O'Brien and Scatter Creek subwatersheds would not increase the road density rounded to the nearest tenth. Though this alternative would not move road density in the Ninemile drainage appreciably towards good condition it would remove the remaining two road/stream barriers by reconstructing the culverts to allow for fish passage outlined in the Ninemile watershed action plan. This is the culvert on 2054 across Ninemile Creek and the culvert on 2054-200 across South Fork Ninemile. The other identified barrier culvert was replaced with an open bottom structure in 2014. Road reconstruction may reduce the number of undersized culverts through culvert upgrades.

Table 105. Resource Indicators and Measures for Alternative 2, Direct/Indirect Effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Direct/Indirect Effects		
Water quality	Sediment delivery	Road surface and condition in proximity to water (affecting PPM and WDR for fish)	Short term increase followed by intermediate term decrease. Levels could return to near present levels in the absence of long term maintenance schedule.		
Water quality	Stream temperature	Canopy cover changes	Small changes to outer zone canopy cover that would have minimal to no effect of stream temperature		
Riparian Function, and Channel Stability	Large woody debris recruitment	LWM and Dominant and subdominant trees	Minimal effects due to possible road reconstruction at stream crossings		
Hydrologic Function	Effective stream length and passage of both organisms and stream material	Barriers to passage	2 removed in Ninemile subwatershed		
		Road density IF is Impaired Function FAR is Functioning at Risk PF is Properly Functioning	Subwatershed	All during	All After
			O'Brien	2.0 FAR	1.9 FAR
			Ninemile	3.1 IF	2.9 IF
			Scatter Creek	4.1 IF	4.1 IF
			Thirteenmile	0.96 PF	0.95 PF
			Upper Hall	0.52 PF	0.52 PF

6.2.4 - Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Cumulative impacts result from the incremental impact of the action **when added** to other past, present and reasonably foreseeable future actions. Past, present, and reasonably foreseeable future actions that could create cumulative effects include non-system roads on Forest Service lands, past timber harvest, the White Mountain and North Star fires and grazing.

Resource Indicator and Measure 1

Past timber harvest, past fires, non-system roads and ongoing grazing have the potential to add to sediment delivery to Sanpoil project streams. All analyzed subwatersheds have both timber harvest and fires in the cumulative effects. Past (within 20 years) and ongoing timber harvest acres has or is affecting 4,154 acres within the O'Brien Creek subwatershed, 2,596 acres in Upper Hall, 548 acres in Thirteenmile, 427 acres in Ninemile, and 265 acres in Scatter Creek subwatersheds. The O'Brien Creek acreage includes two other Forest Service projects that are in process, one of which will be finished before Sanpoil treatments commence. Both of these projects have standard practices to minimize or eliminate sedimentation. Most of the forest practices applications and other private harvests are downstream or otherwise unconnected to the Sanpoil project streams and therefore are unlikely to cumulatively add to sedimentation to the Sanpoil treatment area streams. The exception is the treatment in Thirteenmile but those have a large riparian buffer and so were unlikely to contribute sediment to Thirteenmile. The Sanpoil watershed action plan described several non-system roads that are likely causing sedimentation to streams. These roads can be decommissioned at any point. Past fires, including the White Mountain and North Star fire have likely contributed sediment to the subwatershed streams. The sedimentation effects of the White Mountain fire, in 1988 that affected the O'Brien, Ninemile and Upper Hall Creek subwatersheds, have returned to base levels due to the number of years that have passed. Effects to the Scatter and Thirteenmile Creek subwatersheds from the North Star fire are to the opposite side of the Sanpoil River. Most of these areas now have ground cover and therefore contribute near baseline levels. Cattle grazing occurs in the subwatershed. Cattle can utilize streams for watering and can cause localized sediment sources, especially where road crossings are frequent, defined as every ½ mile or less. These segments tend to encourage cattle trailing along the streams. Though the project may thin thick stands to where cattle could move through the area a design feature is incorporated into the alternative to prevent trailing adjacent to the streams after thinning. When considering these cumulative effects alternative 2 would result in small short-term increases in sediment and followed by an intermediate dip in sediment from improved road maintenance and drainage. With current use levels the benefit from road maintenance may decrease over time to trend near present levels in twenty years without regularly scheduled maintenance.

Resource Indicator and Measure 2

The White Mountain and Northstar fire and prior timber harvest are the past actions that have potential to affect temperature in the subwatershed. The White Mountain fire is over 30 years old and therefore the effects to temperature from this fire are minimal. The Northstar fire affected the opposite side of the Sanpoil River to the project activities and therefore effects are limited to the Sanpoil River which is a relatively open river system. Though waters would not be cooled as much by these tributaries they contribute a very small portion of Sanpoil waters and therefore have little influence on river temperature. Though this alternative may slightly reduce shading during implementation, post-fire shade recovery is likely to offset this. The past timber harvest that affected shading on tributaries will continue to recover incrementally. Thus, when considering cumulative effects, shading and temperature are unlikely to change.

Resource Indicator and Measure 3

Fires and prior timber harvest are the past actions that have potential to affect large wood accumulation in the subwatershed. Most past and ongoing timber harvest was designed to keep wood recruitment into streams at natural levels. In the headwater sections of O'Brien, Ninemile and Thirteenmile Creek subwatersheds, the White Mountain fire pulse of large wood has already occurred. These areas are likely now to experience a lack of large wood for several decades as trees regrow to the point of recruitment. The Thirteenmile and Scatter Creek Northstar area is likely entering the pulse period and may be recruiting higher than normal levels of wood to the west of the Sanpoil River. Thus the balance of wood recruitment across all five subwatersheds may balance through the project area though it is spatially uneven. When added to the miniscule amount of large wood this alternative removes the effects to large wood in streams are likely to be about normal with uneven distribution though the subwatersheds.

Resource Indicator and Measure 4

Lidar imagery suggests that there are approximately 110 miles of non-system roads on the landscape within the five subwatersheds with almost half the mileage in the O'Brien Creek subwatershed. Field work indicates that these roads vary from a few drivable roads to roads that can't be found on the landscape. Some of these roads are not hydrologically stabilized and therefore contribute to watershed effects while others have, from a hydrological standpoint, disappeared from the landscape. Though the non-system roads would not affect open road density, those that are not hydrologically stabilized could contribute to effective road density. After project completion, approximately 8 miles of the non-system roads that are identified on the landscape would be obliterated or otherwise hydrologically stabilized and therefore the effective road densities would be reduced more than the no action alternative.

Table 11. Resource Indicators and Measures for Alternative 2 Cumulative Effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Cumulative Effects
Water quality	Sediment delivery	Road surface and condition in proximity to water (affecting PPM and WDR for fish)	Small risks of increased sedimentation from project activities, intermediate decreases in sedimentation from improved maintenance and drainage from project activities over the no action alternative. The intermediate benefits from road maintenance may decrease over time.
Water quality	Stream temperature	Canopy cover changes	Very low risk of short-term increases
Riparian Function, and Channel Stability	Large woody debris recruitment	LWM and Dominant and subdominant trees	Average large wood amounts in streams, somewhat unevenly distributed through watershed
Hydrologic Function	Effective stream length and passage of both organisms and stream material	Road density	Small potential for higher effective road densities during the project due to non-system roads affecting hydrology and greater effective road decrease in the long term due to project obliteration or hydrologic stabilization of level 1 (closed) and non-system roads

7.0 - Summary

These tables summarize the bottom-line conclusions of the aquatics analysis for each alternatives.

7.1 - Degree to Which the Purpose and Need for Action is Met

Table 12. Summary comparison of how the alternatives address the purpose and need

Purpose and Need	Indicator/Measure	Alt 1	Alt 2
Reduce sediment delivery to streams as part of improving or maintaining water quality, watershed function and aquatic habitat	Sediment delivery	Remains the same if no stand replacing wildland fire, increases if a fire occurs	Short term increase followed by a decrease due to road improvements that may decrease to near present over decades. Less risk of an increase resulting from fire than the no action.
Reduce sediment delivery to streams as part of improving or maintaining water quality, watershed function and aquatic habitat	Large woody debris recruitment	Remains near present levels if no moderately severe wildland fires near streams, conversion to LWM then lack of recruitment if such fire occurs	Improvement in a low wood section in Upper Ninemile creek. Elsewhere minimal effects due to possible road reconstruction at stream crossings. Cumulatively about normal recruitment with spatial anomalies not substantially affected by alternative 2

7.3 - Summary of Environmental Effects

Table 13. Summary comparison of environmental effects to aquatic resources

Resource Element	Indicator/Measure	Alt 1	Alt 2
Water quality	Sediment delivery	Remains the same if no stand replacing wildland fire, increases if a fire occurs	Short term increase followed by a decrease due to road improvements that may decrease to near present over decades. Less risk of an increase resulting from fire than the no action.
Water quality	Stream temperature	Temperature slowly decreases over time if no large moderate or moderately severe wildland fire, increases with such fires	Small changes to outer zone canopy cover that would have minimal to no effect of stream temperature in the short term. Potential for increased shade due to tree release in the long term
Riparian Function and Channel Stability	Large woody debris recruitment	Remains near present levels if no moderately severe wildland fires near streams, conversion to LWM then lack of recruitment if such fire occurs	Improvement in a low wood section in Upper Ninemile creek. Elsewhere minimal effects due to possible road reconstruction at stream crossings. Cumulatively about normal recruitment with spatial anomalies not substantially affected by alternative 2

Resource Element	Indicator/Measure	Alt 1	Alt 2
Hydrologic Function	Effective stream length and passage of both organisms and stream material	Remains the same.	Increases slightly (2.9 to 3.1) with temporary roads in the Ninemile subwatershed and remains the same in the other four subwatersheds during treatment. Reduces slightly (2 to 1.9) in the O'Brien subwatershed and returns to present density in Ninemile subwatershed after project completion. Unaffected in other three subwatersheds

8.0 - Compliance with LMP and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 complies with all applicable LMP Water Resources and Riparian Management Area standards (LMP p. 55-56 and 121-122). It would not contribute to water resources objectives since no action would be taken. Since road crossings of streams would not be improved under this alternative this alternative would not remove known migration barriers to fish in Ninemile and South Fork Ninemile. This alternative increases the risk of a moderately severe fire burning in the watershed. If a moderately severe fire burns a large portion of the watershed then it is likely this alternative would not meet LMP water resources standard 3 and possible that this alternative would not meet LMP Fisheries standard 5 over the long-term. Alternative 1 would not meet desired conditions for stream crossings since crossings would not be minimized or upgraded and could fail to meet water quality desired future conditions and the clean water act provisions if a large fire burns. Since no federally listed fish are in the project area the project would have no effect on bull trout. This alternative would have no effect on redband or cutthroat since they are not known in the area and habitat would not be affected without a large moderately severe fire. The alternative would not move us towards improving watershed condition class as outlined in the watershed condition framework. BMPs would not be applicable under this alternative.

Alternative 2 complies with all applicable LMP Water Resources and Riparian Management area standards (LMP p. 55-56 and 121-122) since it has design elements to protect and enhance RMA's for the long-term and replaces two crossings on perennial streams within the Ninemile subwatershed. This alternative also moves the area towards desired conditions and incrementally moves the subwatershed towards improving watershed condition class. Since no federally listed fish are in the project area the project would have no effect on bull trout. This alternative would have no effect on cutthroat since they are not known in the area and habitat would not have appreciable changes in temperature or large woody debris. Habitat may improve in the post project due to reduction in sediment delivery from road improvements and decommissioning and increases in health of riparian trees. Since redband are present in O'Brien creek, for the above habitat reasons the Sanpoil project may affect individuals but would not trend redband towards federal listing. Applicable BMPs would be followed by the project ensuring compliance with National Best Management Practices.

9.0 - Other Relevant Mandatory Disclosures

This project complies with the Endangered Species Act and the Clean Water Act.

9.1 - Intensity Factors for Significance (FONSI) (40 CFR 1508.27(b))

The Sanpoil project would have no effect to the following species due to the lack of individuals and critical habitat: Bull trout (*Salvelinus confluentus*).

The Sanpoil project would have no effect to the following Forest Service Sensitive species due to lack of individuals and suitable habitat: Pygmy whitefish (*Prosopium coulteri*), and Umatilla Dace (*Rhinichthys umatilla*). It would have no effect on Lake Chub (*Couesius plumbeus*) due to lack of individuals and barriers to migration into the area. The no action alternative in the absence of large wildfire would also have no effect to Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and Interior Redband trout (*Oncorhynchus mykiss gairdneri*) and other trout (MIS).

The Sanpoil project, alternative 2, may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species for the following species: Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and Interior Redband trout (*Oncorhynchus mykiss gairdneri*). This is because of short term-increases of sedimentation followed by intermediate to long term decreases and minimal decreases in canopy followed by a chance of increased canopy because of increased riparian vigor (with subsequent negligible chance of temperature increases followed by small temperature decreases). For trout MIS changes to habitat would be the same as for the two Forest Service sensitive species above.

The soils report addresses impacts to wetlands. The no action alternative would not impact Clean Water Act designations either way. For alternative 2, though South Fork O'Brien is a water of concern for DO, the effects of this project are unlikely to affect DO. The distance of treatments from the stream makes it highly unlikely to affect particulate organic matter delivery to the streams, temperature is unlikely to change and changes to aeration of South Fork O'Brien are not expected since the stream bed is not anticipated to be affected by the project. Temperatures are within state standards and the very small shading changes are very unlikely to affect temperature enough to exceed state standards. South Fork O'Brien is a category 2, suspect waters for pH but as with DO above the treatment design is highly unlikely to affect particulate organic matter delivery to the streams. Though both South Fork O'Brien and Thirteenmile Creek are category 2 waters for bacteriological contamination, it is anticipated that the ongoing management to improve cattle distribution would continue and therefore treatments would be neutral in attaining the Clean Water Act standards.

13.0 - References Cited

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Appendix 1. BMPs

Best Management Practices for the Sanpoil Project

Plan-2 Project Planning and Analysis – Use the project planning, environmental analysis, and decision-making process to incorporate water quality management BMPs into project design and implementation (pp 14-16)

Plan-3 Streamside Management Zone and Planning – To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities. (pp 17-18)

AqEco-1 Aquatic Ecosystem Improvement and Restoration Planning – Reestablish and retain ecological resilience of aquatic ecosystems and associated resources to achieve sustainability and provide a broad range of ecosystem services. (pp 19-20)

AqEco-2 Operations in Aquatic Ecosystems – Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems. (pp 21-23)

AqEco-4 Stream Channels and Shorelines – Design and implement stream channel and lake shoreline projects in a manner that increases the potential for success in meeting project objectives and avoids, minimizes, or mitigates adverse effects to soil, water, and Riparian resources. (pp 26-28)

Road-1 Travel Management Planning and Analysis – Use the travel management planning and analysis processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during road management activities. (pp 105-107)

Road-2 Road Location and Design – Locate and design roads to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. (Applies due to road relocation, see BMP Technical guide pp 107-110)

Road-3 Road Construction and Reconstruction – Avoid or minimize adverse effects to soil, water quality, and riparian resources from erosion, sediment, and other pollutant delivery during road construction or reconstruction. (pp 110-111)

Road-4 Road Operations and Maintenance – Avoid, minimize or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road. (pp 111-114)

Road-5 Temporary Roads – Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of temporary roads. (pp 114-115)

Road-6 Road Storage and Decommissioning – Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by storing closed roads not needed for at least 1 year (Intermittent Stored Service) and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns, and minimize erosion. (pp 115-117)

Road-7 Stream Crossings - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing, reconstruction, or maintaining temporary and permanent waterbody crossings. (pp 117-120)

Road-8 Snow Removal and Storage – Avoid or minimize erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities. (pp 120-122)

Road-9 Parking Sites and Staging Areas - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing and maintaining parking and staging areas. (pp 122-123)

Road-10 Equipment Refueling and Servicing - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from fuels, lubricants, cleaners, and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities. (pp 123-124)

Veg-1 Vegetation Management Planning – Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during mechanical vegetation treatment activities. (pp 128-130)

Veg-2 Erosion Prevention and Control - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments. (pp 131-132)

Veg-3 Streamside Management Zones - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when conducting mechanical vegetation treatment activities in the AMZ [RMA]. (pp 132-134)

Veg-4 Ground-Based Skidding and Yarding Operations - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies. (pp 134-135)

Veg-5 Cable and Aerial Yarding Operations - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during cable and aerial yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies. (pp 135-136)

Veg-6 Landings - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of log landings. (pp 136-137)

Veg-7 Winter Logging - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from winter logging operations. (pp 137-138)

Veg-8 Mechanical Site Treatment - Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling the introduction of sediment, nutrients, chemical, or other pollutants to waterbodies during mechanical site treatment. (pp 138-139)

Fire-1 Wildland Fire Management Planning – Use the fire management planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during wildland fire management activities. (pp 52-54)

Fire-2 Use of Prescribed Fire – Avoid, minimize, or mitigate adverse effects of prescribed fire and associated activities on soil, water quality, and riparian resources that may result from excessive soil disturbance as well as inputs of ash, sediment, nutrients, and debris. (pp 54-56)